THE ANALYSIS OF IN PUBLIC AND SOCIAL EQUIPMENTS OF PUBLIC HOUSING UNITS CONSTRUCTED IN TURKEY

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1.INTRUDUCTION

Housing is a common problem in Turkey and developing countries. The solution to this problem lies in the rapid and cheap production of housing and this can be achived by constructing publýc housing units. Unfurtunately, the public housing loans given to same construcion cooperations have been used only in the construction of housing blocks but not in the costruction of substructural and social facilities.

As, a result there, have emerged residences where subsructure and social facilities are either insufficent or lacking. This has led the inhabitants of such residences to use the neigboring residences. Consequently, this has resulted in the overuse of the available facilities. The lack of substructure and social facilities obviously affects not only the habitants of a specific district but also the municipaities, in terms of city planning.

The problems which have arisen in public housing units that have been constructed in Turkey and developing countries have not been sufficiently dealt with or taken into consideration. The fact that substructure, enviremental arrengement and social facility areas have not been dealt with or have not been comlated has led to a study in his respect.

This aim of this study is to examine the cost, which is the major cause in the necligence of subsructure and social facilitiy although they do exist in the plan of housing units but are not applied, and to bring out the mathematical ration of the cost of these facilities to the total unit cost.

1.1 PROCEDURE

In these study, substructure and social facilities which should be planned according to the size of the mass housing unit and to the population size of the public housing units have been considered in accordance to Public Works Law No. 3194 and to the definitions given in No. 2985, 2. Public Housing Law and Applications Regulation, which was validet in 1984 in the Offical Gazette. The seven Public housing units used as sampling of the study have over 1000 houses. The spendings of house, substructure, social facilitiey and enviromental arrangement in these units built between the yeras 1987 and 1992 have been uopdated according to 1997.

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In these update, the Compound Interest Method has been made use of. The connection in the Compound Interest Method is as fallows:

F= p (E+1) + p (E1+1) + ... p (En +1)
The sembols refer to the following:

F= The updated total unit cost
P= The money spent in every year
E= Work manship and material prices changing according to the years.

After the process of updating, with the results fund,
the cost per house, and m2,
the cost of subsructure per house, and per m2,
the cost of social facilities per house and per m2,

After the process of updating, with the results found. the cost per house, and m2, the cost of subsructure per house, and per m2, the cost of social facilities per house and per m2,and if they exist, the cost of enviromental arregenments per house and per m2 have been calculated. After this sequance, Multible Regresyon Analysis affecting the total cost, substructure, social facilities and environment arrangement expenses in public housing units. SPSS For Windows Computer programing has been used in this test.The analysisd of multible regression has been made by the method of subsequent smallest squares and STEPWÝSE method has been used in determine the variants to be entered into the equation.

The values of density, unit base area coefficient which directly affect substructure, social facility and environment arrangement if exissts costs have been tested by the process of regression. The results reached have helped to reveal to what axtent and under what circumtances substructure, social facility and environment arrangement cost affect the total unit cost.

2.THE ANALYSIS OF THE FACTORS WHICH AFFECT COST OF PUBLIC HOUSING UNITS IN TURKEY

The units chosen for this study comform to the mass housing definition indicated in No: 2985 , 2 nd Publýc Housing law and and Applications Regulation. within the borders of the big city municipalities, units consisting of 1000 houses and having a population of 5000 are considered public housing units. Moreover, the social facilities which ought to exist on this scale according to the same law are defined as in the following.

Social facilities : " school, sports center, healt facilities, theatre, library, day nursery, cinema, auditorium, swimming pool, police depertmant, post office, place of workship, playgrounds, enviromental arrangement and the like.

"The facilities which make up the social facility cost in the public housing units studied are shown in table 1.

Table 1: The facilities which make up the social facility cost in the public housing units.

PUBLIC HOUSÝNG UNÝTS	SOCÝAL FACÝLÝTÝES and QUANTÝTÝES
Gaziemir	1 elementary school 4 shopping centers, 2 social facility buildings, 2 nurseries, 1 communication center.
Bahçeþehir	1 elementary school, 1 private, junior high school, 1 shopping center, 1 clinic, 1 communacation center, 1 social facility center, game and sports areas.
Ataköy 7-8 District	2 elementary schools, 1 high school sports and game areas.
Ataköy 5. District	2 elementary schools, 1 shopping center, 1 nursery, sports and game areas.
Halkalý 2-3 District	2 elementary schools, 2 junior high schools, 5 shopping centers, 1 social center, 1 healt center, 8 nursery.
Eryaman 2-3. District	2 elementary schools, 1 high school 1 shopping center, 1 social center, 1 hospital, 2 nurserys, sports and game areas.
Yahyakaptan	2 elementary schools, , 1 shopping center, 1 hospital, 1 cinema, 1open pazar area, sports and game areas.

Resurse: H., UNUTMAZ. " The Study Of The Effects of Social And Substructural Facilities Ýn Public Housing Units On Total Cost. " PH. D. thesis. 1994.

The substructural facilities that ought to be built in public housing units are defined in the law as in the following. According to this definition,

Substructure : " Roads, water electricity, drainage, telephone, central antenna, central communication, central heating and such facilities, and all of the facilities which these require. "The facilities which make up the substructure cost in the seven public housing units studied areLot arrengement and excavation works,road and parking lot constructions, electricity and clean- used water installations, central heating installations,telephone and satellite television installement works,. garbage disposal system installations.

The information releating to the lot area, number of floors, gross densities, base area coefficients, Floor area coenfficients of the public housing units chosen to be used in the Multible Regression Analysis and the numerical values found by calculating the substructure and social facilitity cost (Updated according to the year 1994) in the public housing units which were planned according to the above devinitions and whose construction constracts were awarded by the Estate Bank, according to the total cost are indicated in the table 2. below.

Table 2: The numerical propotion of the expenses of substructure and social facility constructions in the total costs of the public housing units studied and general information on these units.

Name of unit	number of houses	plan popul.	lot area (ha)	density person/ (ha)	base area coeffic.	floor area coeffic.	substru total cost. %	facility total cost %
gaziem.	1962	8800	37.1	220	0.25	2.00	11	7
bahçe þehir	2081 (446) (1635)	7500	70.9	122	 0.10 0.30	 0.30 0.80	 12 10	4
ataköy 7-8.part	2964	12500	48.1	256	0.20	1.50	10	5.5
ataköy 5.part	2993	13450	99.0	427	0.11	1.14	8	9.5
halkalý	4310	18250	66.6	269	0.25	2.16	9.9	7.1
erya-man	4740	21000	100.4	296	0.23	2.16	9.7	4.6
yahya kaptan	4902	22000	62.6	326	0.25	2.05	9	9.2

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Comforming to the table above, Multible Regresyon Analiysis has been made by using Stepwise Procedure on SPSS For Windows Computer Programme. According to this,
Factor saffecting the substructure cost per house; An inverse propotion has been found between the substructure cost per house, and the gross density of the unit. In other words, it has been observed that the ratio of substructure costs to the total unit cost declines ýn public housing units of heigher density.

There is a direct propotion between the substructure cost per house and the value of "Base Area Coenfficient" . That is, in public housing units where the Base Area Coefficient is high, the cost of substructure in the total cost has gone up,too.

There has been found an inverse propotion between the substructure cost per house and " Floor Area Coefficent ". In other words, as the Floor Area Coefficient go up, the cost of substructure in the total cost decreases. " Halkalý, Eryaman and Yahyakaptan ' mass housing units can be given as examples to this.

Factorrs Affecting the Social Facility Cost Per House: It has been observed that there is a direct propotion between the social facility cost per house and the density values of the units. Accordingly, in sample units where the density is high, the proportion of social facility cost to the total unit cost is high, too.

It has also been found that the cost of social facilities per house are directly proportinoal to the Base Area Coefficients of the units. Thus, in the mass housing units whose Base Area Coefficients are high, the proportion of social facilitiey costs the total unit cost is high,too.
The social facilitiy cost per house is also directly proportinonal to the Floor Area Coefficients. Thus, It has been observed that mass housing units with higher Floor Area Coefficients also have higher social facility costs in relation to their total cost. As an exaple to this, Yahyakaptan mass housing unit can be given, where both the Base Area Coefficient and the Floor Area Coefficient and the Floor Area Coefficient are high. In this unit, the ratio of social facility costs to the total cost has proved to be high, too. Another reason for this relationship is that there will be a higher demand for social facilities in units of denser populations. This result is obviosly true as the social facility areas will increase in terms of area variety.

Ýt has been observed that there is an inserve proportion between the total cost of the house and the gross density values of the units. According to this, the total cost has proved to decrease in units where the density values go up. Ýt has also been observed that the Base Area Coefficients and the total unit cost area inversely proportional. As a result, as, Base Area Coefficient go up, the total cost decreases.

The ratio between the total cost and the Floor Area Coefficient is inverse, too. Thus, the total cost is lower in public housing units whose Floor Area Coefficient are high.One other factor which causes the change of substructure and social facility costs in terms of total cost is the sloping degree of the lot. Out of the seven units studied, all the units except for " Ýstanbul Bahçeþehir ", are situated in lots where the slopping degree is between % 5 and % 10. In the lot on which Bahçeþehir is costructed, the slopping degree is over % 15.

This fact has led to an even higher increase in the substructure cost of the parts with two storey villa type houses.It also explains how these facilities affect the cost. The total cost, social facilitiy and substructura costs per m2 in the units are shown in Table 3.

Table 3: The comperison of the total social facility, substructure and total costs per m2 in the units.

Number of Residences name	Social Facility cost per m2 /USD	Substructure Cost per m2/ USD.	Total Cost Per m2/ USD
Gaziemir	6.3	10.8	96.67
Bahçeþehir	5.1	19.4 10.95	155.85 100.7
Ataköy 7-8 part	7.0	14.62	146.62
Ataköy 5. part	10.95	10.42	116.85
Halkalý	7.42	9.3	93.67
Eryaman	4.05	8.55	87.97
Yahyakaptan	8.62	8.47	57.4

Resurse: Unutmaz., H., " The Study Of Effects Social And Substructural Facilities In mass Housing Units On Total Cost " 1994

3.CONCLUSION

It is seen that the substructure and social facilities planned for mass housing units, depending on their quantity and size, will lead to an additional cost in the total cost of the house. As a result of studies on the number of houses in the unit, grass density, the slopin degree of the lot on which the units is situated, Base Area Coefficient and on Floor Area Coefficient, all of which are the outstanding factors affecting substructure and social facility costs directly, the following facts have been concluded.

In two public housing units where the number of houses does not exceed 2000, substructure cost makes up % 11 of the total cost. In the same category, the social facility cost is % 7.1 of the total cost. Only the cost of one house, exluding substructure and social facilities, is % 81.9 of the total cost.

In two public housing units where the number of houses varies between 2900 and 3000, the cost of substructural facilities per house unit makes up % 10.5 of the total cost.

The percentage of the social facilities cost per house to the total cost in the same category is % 9.5. Here, the cost of one house, excluding substructural and social facility costs, is % 80 of the total cost. On the other hand, in three public housing units in which the number of houses is 4000 -5000, the percentage of substructural facility cost per house to the total cost varies between % 9 and % 9.9.

While the substructure cost constitues % 9.9 of the total cost in a unit with 4000-4500 houses, this percentage has fallen down to % 9.7 in a unit with 4500-4750 houses. In a housing unit where the number of houses varies between 4750-5000, the cost of substructural facilities is % 9 of the total cost of unit the unit.

Thus, it can be said that as the number of houses in a unit increases, the percentage of substructure cost the total unit cost decreases.
In the above mentioned category, the ratio of social facility costs to the total cost varies between % 4.6 and % 9.2. The informations in table 1 show that the social facilities in every unit differ in number when compared with each other.

" Eryaman Housing Complex " can be taken as an example here. This complex has a lower quantity of social facilities as compared to " Halkalý " and " Yahyakaptan " public housing complexes which are of the same dimension as itself. This has resulted in a lower ratio of the social facility cost to the total unit cost, which is % 4.6. This ratio is " Yahyakaptan Complex ' which had been planned with almost the same dimensions, being % 9.2, is much higher.

In two of three units in this category, landscape expenses have separately been determined. These expenses constitute % 5.1 - % 6 of the total cost. In Yahyakaptan Public Housing Complex, where the gross density is a population of 326 per hectare, substructure cost is the lowest portion of the total cost. One reason for this is that the Floor Area Coefficient value as well as the density value is higher than those of the other units. Another reason is that this complex has a highre house capacity with 4902 houses than the other housing units. Thus its substructure expenses constitute as lower portion of the total unit expenses.

The Multiple Regression Analysis process which has been used to bring out the elements affecting the ratio of substructure and social facility costs to the total cost has indicated the fact that as the density of units increases, the ratio of substructure facility costs to the total cost decreases. On the other hand, since the quantity and qualty of social facilities would increase when the population of the units increases, the costs of these facilities would naturally go up, too.This inevitably leads to a higher ratio of social facility expenses in the total unit cost.

According to the results of the Regression Analysis, in the public housing units with a lower Base Area Coefficient, the costs of substructure and social facilities decrease when compared to the units which have a higher Base Area Coefficient. However, in the units where the Floor Area Coefficient is high, substructure and social facility expenses are lover than those of units with a lower Floor Area Coefficient. In " Eryaman, Yahyakaptan and Halkalý Public Housing Units ", since their Floor Area Cofficients are higher than those of the other units, the costs of substructure and social facilities prove to be lower when compared to the other four public housing units.

This study has shown that public housing units consisting of fewer than 1000 houses are not financially appropriate. As an example to this, Istanbul Bahçeþehir Public Housing Complex which has a capacity of 2081 houses can be given. One part of this complex consist of 446 villa type hoses and in this part the substructure cost makes up % 12 of the total unit cost. But in the maining part which built on the same type of land lot and which consist of 1635 apertmant houses, this ratio is only % 10 of the total unit cost. A difference of % 2 in the substructure cost would naturally affect the total cost and thus the total cost would go up.

According to the results given above and interms of city planning, in a housing complex of minimum 1000 houses- as accepted by both the currently valid No:2985, Second Public Housing Law and Applications Regulation in Turkey and No: 3194 Housing and Construction

Law, the requirements to be met in order to reduce the unit cost are indicated below: Provided that first class construction materals are used, for a unit of 1000 houses.

1.The most of approprite gross density is 326-427 person/hectar.
2.The most of appropriate Base Area Coefficient is 0.10 - 0.15.
3.The most appropriate Floor Area Coefficient is 2.05 - 2.18,
4. The most appriprotate slope degree of area is % 5 - % 10.
5.The average floor number is 8 - 11.

The resarch done has proved the above mentioned standarts. As Long as these standarts are comformed to, the substructural facility cost will make up % 9 - % 9.9 and social facility cost will make up % 9.5 of the total cost.

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